

Applicant: Neutel
Application No.: Unassigned
Filing Date: Herewith
Docket No.: 903-170 PCT/US
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A. Amendments to the Specification:

Please add the following immediately after the title of the invention:

CROSS-REFERENCE TO RELATED APPLICATIONS:

This application is the National Stage of International Application No.

PCT/NL2004/000460, filed June 29, 2004, which claims the benefit of Netherlands Application No. NL 1023776, filed June 30, 2003, the contents of which is incorporated by reference herein.

Please add the following new paragraph immediately prior to page 1, line 5, and after the Cross Reference to Related Applications, as follows:

FIELD OF THE INVENTION:

Please add the following new paragraph immediately prior to page 1, line 7, as follows:

BACKGROUND OF THE INVENTION:

Please delete the paragraph beginning at page 3, line 1, and ending at page 3, line 20.

Please amend the paragraph beginning at page 3, line 21, as follows:

Such a robot is known from DE 196 08 844. In the case of the known robot a drive device is provided on one end of the base. The drive device includes ~~comprises~~ several motors which engage on toothed belts in order to drive the arm and the slide. The known robot has a gripper which is fitted on one side of the slide and therefore extends alongside the arm. In the case of this known construction torsional forces occur on the arm when a product is being lifted

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with the gripper, which leads to a heavier construction of the base, the arm and other parts of the robot, in order to enable them to offer resistance to these torsional forces. The heavier construction has an adverse effect on the speed of the robot.

Please amend the paragraph beginning at page 3, line 33, as follows:

An object of the invention is to provide an improved robot ~~of the type mentioned in the preamble of claim 1~~ which is capable of working at higher speed.

Please add the following new paragraph immediately prior to page 3, line 36, as follows:

SUMMARY OF THE INVENTION:

Please amend the paragraph beginning at page 3, line 36, as follows:

This object is achieved by a robot ~~according to the preamble of claim 1,~~ for gripping and handling one or more objects, which robot comprises:

- a stationary base with a first guide extending in a first direction,
- an arm comprising a second guide extending in a second direction at an angle relative to the first direction, preferably perpendicularly to the first direction, which arm is connected to the base by way of the first guide in such a way that the arm is movable in the first direction,
- a slide which is arranged on the second guide and is movable in the second direction,
- a gripper supported by the slide, for gripping one or more objects, which gripper is movable in a third direction intersecting the plane of the first and second directions, preferably perpendicularly,

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a number of actuators provided in a stationary position on the base, for driving the arm, the slide and the gripper by means of pulling elements, for example drive belts, which are connected to the arm, the slide and the gripper respectively, wherein ~~characterized in that~~ the gripper is situated in an imaginary plane extending in the second and third directions and intersecting the central longitudinal axis of the arm. The advantage of this is that when a product is being lifted by the robot no torsional forces occur on the arm. Owing to the absence of torsional forces which require resistance to be offered to them, a lighter construction of the arm will suffice, which results in fast dynamic behaviour of the robot.

Please amend the paragraph beginning at page 6, line 11, as follows:

In a ~~[[A]] further embodiment of the invention is characterized in that~~, the actuators, viewed in the first direction, are distributed on the base.

Please amend the paragraph beginning at page 7, line 3, as follows:

In a ~~[[A]] further preferred embodiment is characterized in that~~ of the invention, the pulling elements and the actuators are connected by means of a transmission. The pulling elements are consequently not directly connected to the actuators, with the result that a transmission ratio can be achieved which is such that only one type of motor is required.

Please add the following new paragraphs immediately after page 7, line 23, as follows:

A further aspect of the invention relates to a robot for gripping and handling one or more objects, which robot comprises:

- a stationary base with a first guide extending in a first direction,

- an arm comprising a second guide extending in a second direction at an angle relative to the first direction, preferably perpendicularly to the first direction, which arm is connected to the base by way of the first guide in such a way that the arm is movable in the first direction,
- a slide which is arranged on the second guide and is movable in the second direction,
- a gripper supported by the slide, for gripping one or more objects, which gripper is movable in a third direction intersecting the plane of the first and second directions, preferably perpendicularly,
- a number of actuators provided in a stationary position on the base, for driving the arm, the slide and the gripper by means of pulling elements, for example drive belts, which are connected to the arm, the slide and the gripper respectively, wherein the actuators, viewed in the first direction, are distributed on the base.

Another aspect of the invention relates to a robot for gripping and handling one or more objects, which robot comprises:

- a stationary base with a first guide extending in a first direction,
- an arm comprising a second guide extending in a second direction at an angle relative to the first direction, preferably perpendicularly to the first direction, which arm is connected to the base by way of the first guide in such a way that the arm is movable in the first direction,
- a slide which is arranged on the second guide and is movable in the second direction,
- a gripper supported by the slide, for gripping one or more objects, which gripper is movable in a third direction intersecting the plane of the first and second directions, preferably perpendicularly,
- a number of actuators provided in a stationary position on the base, for driving the arm, the slide and the gripper by means of pulling elements, for example drive belts, which are

connected to the arm, the slide and the gripper respectively, wherein the robot is provided with a housing comprising a first housing part which surrounds the base and a second housing part which surrounds the arm.

In yet another aspect of the invention, a robot is proposed for gripping and handling one or more objects, which robot comprises:

- a stationary base with a first guide extending in a first direction,
- an arm comprising a second guide extending in a second direction at an angle relative to the first direction, preferably perpendicularly to the first direction, which arm is connected to the base by way of the first guide in such a way that the arm is movable in the first direction,
- a slide which is arranged on the second guide and is movable in the second direction,
- a gripper supported by the slide, for gripping one or more objects, which gripper is movable in a third direction intersecting the plane of the first and second directions, preferably perpendicularly,
- a number of actuators provided in a stationary position on the base, for driving the arm, the slide and the gripper by means of pulling elements, for example drive belts, which are connected to the arm, the slide and the gripper respectively, wherein a first bush and a second bush are provided on the slide, which bushes are drivable by means of a pulling element, and in that the gripper comprises a round shaft member projecting through both bushes, the shaft member being provided on the periphery with cams placed in a spiral shape, the first bush being provided with a spiral-shaped groove which can interact with the cams on the shaft member in such a way that a rotation of the first bush results in a translation of the shaft member, and the second bush being provided with a straight axial groove which can interact with the cams in such a way that a rotation of the second bush results in a rotation of the shaft member.

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The invention further relates to a conveyor system comprising a conveyor and a robot as is described above, in which the robot is designed to pick up one or more objects from a conveyor and to place the object(s) at a location next to the conveyor.

The invention also relates to a method for packaging foods, in which use is made of the said conveyor system.

Please delete the paragraph beginning at page 7, line 24, which begins with “It is pointed out...”.

Please delete the paragraph beginning at page 7, line 29, which begins with “The invention further...”.

Please add the following new paragraph immediately prior to page 7, line 31, as follows:

BRIEF DESCRIPTION OF THE DRAWINGS:

Please amend the paragraph beginning at page 7, line 31 as follows:

The invention will be explained in greater detail in the description below, with reference to [[a]] the drawings, in which:

Fig. 1 shows a diagrammatic view of a scara robot known from the prior art;

Fig. 2 shows a diagrammatic view of a delta robot known from the prior art;

Fig. 3a shows a diagrammatic view in perspective of a robot according to the invention;

Fig. 3b shows an exploded view of the robot of Fig. 3a;

Fig. 3c shows an exploded view of the robot of Fig. 3a without actuators;
Fig. 4a shows another diagrammatic view in perspective of the robot of Fig. 3a;
Fig. 4b shows an exploded view of the robot of Fig. 3a according to the view of Fig. 4a;
Fig. 4c shows an exploded view of the robot of Fig. 3a without actuators according to the view of Fig. 4a;
Fig. 5 shows a view in perspective of a robot according to the invention on a mobile frame;
Fig. 6a shows a top view of the robot of Fig. 3a;
Fig. 6b shows a cross section of the robot along the line A-A in Fig. 6a;
Fig. 7a shows an axial section of a shaft member of a gripper for a robot according to the invention;
Fig. 7b shows a cross section along the line A-A in Fig. 7c of the slide of the robot according to the invention;
Fig. 7c shows a cross section of the slide of the robot according to the invention;
Fig. 8 shows a diagrammatic view of a conveyor system provided with a robot according to the invention;
Fig. 9a shows a top view of a detail of a possible belt drive in an idle position of the robot of Fig. 3a;
Fig. 9b shows a top view of the detail of Fig. 9a in a working position, and
Fig. 10 shows a top view of a detail of an alternative belt drive in an idle position of the robot of Fig. 3a.

Please add the following new paragraph immediately prior to page 8, line 29, as follows:

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS: